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False Polygonaceae smut: increasing knowledge about *Sphacelotheca polygoni-serrulati* Maire in Australia

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Abstract

We report the first record of *Sphacelotheca polygoni-serrulati* Maire on live *Persicaria decipiens* (R.Br.) K.L.Wilson flowers and also on some herbarium collections for the Australian Capital Territory (ACT) and the state of Victoria, dating as far back as 1956. Our determination is based on molecular, macro-, and micro-morphological spore ornamentation characters. We also clarify phylogenetic relationships of Polygonaceae hosts with regard to *Sphacelotheca* and related mycoparasites. Our findings show the importance of living and herbarium collections as data sources for increasing our knowledge about interactions of plants and fungi.

Key words: anther smut, Caryophyllales, Microbotryaceae, plant parasite, teliospore ornamentation, urban biodiversity

Introduction

The study of interactions between fungi and plants is important because fungi are both significant plant mutualists and disease agents. In the buckwheat family, Polygonaceae, examples of beneficial interactions include ectomycorrhizal fungal symbionts on roots of *Bistorta vivipara* (L.) Delarbre (Mühlmann *et al.* 2008) and arbuscular mycorrhizae on *Fagopyrum* Mill. (Likar *et al.* 2008). These root-associated fungi are known to benefit plant partners through increased nutrient, mineral and water up-take in exchange for carbohydrates (Wang & Qiu 2006).

However, some Polygonaceae clades, including Fagopyreae, Persicarieae, Polygoneae, and Rumiceae (Fig. 1), are parasitised by rust and false smut fungi belonging to the Pucciniomycotina (Microbotryaceae) and the distantly related Ustilaginomycotina (*Entyloma* de Bary, *Melanopsichium* G. Beck, and *Thecaphora* Fingerh.) (Vánky 1994; Vánky & Oberwinkler 1994; McKenzie 1998; Vánky 2002; Kemler *et al.* 2006; Piątek *et al.* 2012; Vasighzadeh *et al.* 2014; Klenke & Scholler 2015). False smuts were split from *Ustilago* (true smuts), which use monocots such as Poaceae as hosts, based on morphological (Langdon & Fullerton 1978; Blanz & Gottschalk 1984) and molecular data (Aime *et al.* 2014). This parasitism could have an application in controlling invasive plant species, since fungal leaf endophytes from *Persicaria amphibia* (L.) Delarbre may

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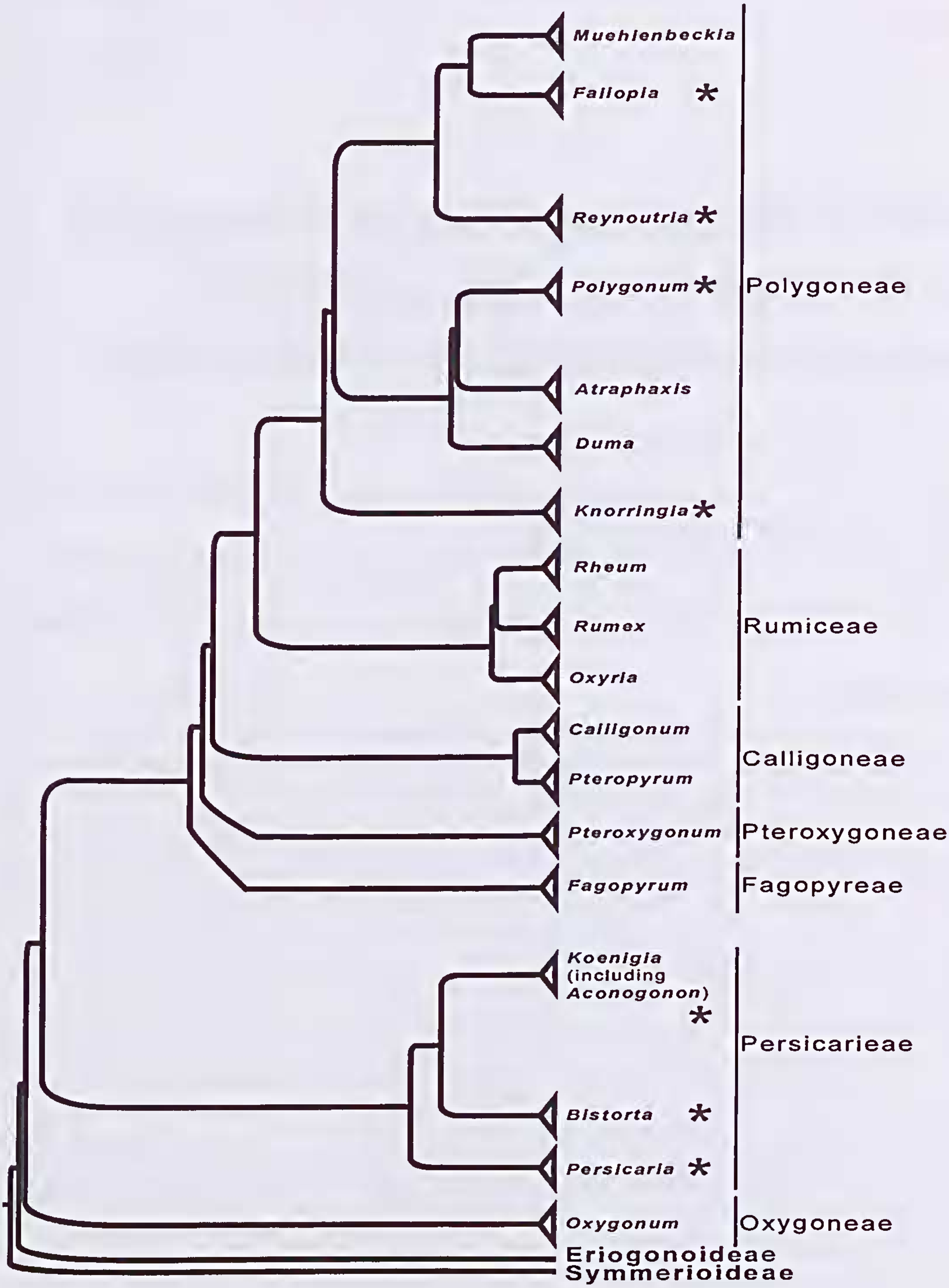
Figure 1. Cladogram of Polygonoideae (modified from Schuster *et al.* 2015) marking the position of *Polygonum* and genera split from *Polygonum* s.l. with asterisks. Polygonaceae tribes are indicated by bars to the right of the tree.



increase the effectiveness of third-party rust fungi with the potential to control the invasive plant *Reynoutria japonica* Houtt. (Kurose *et al.* 2012).

Rusts (*Puccinia* Pers. and *Uromyces* (Link) Unger) occur on leaves, stems and roots of Rumiceae and Polygoneae, while false smuts (mainly Microbotryaceae including *Liroa* Cif., *Microbotryum* Lév., *Sphacelotheca* de Bary, and *Zundeliomyces* Vánky) usually inhabit anthers and ovaries of all four of these Polygonaceae tribes (Kemler *et al.* 2006). Since parasitic fungi often depend on specific host plants (Lutz *et al.* 2005), knowledge of host plant identity and phylogeny is critical for the identification and interpretation of the evolutionary history of associated mycoparasites. Recent molecular analyses of the buckwheat family have clarified the phylogeny of this diverse plant group (e.g., Sanchez *et al.* 2009; Schuster *et al.* 2015). These contributions aid in the assessments of the taxonomy and evolution of their fungal parasites. To facilitate interpretation of the complicated *Polygonum* s.l. nomenclature, Fig. 1 gives the current phylogenetic position of genera split from it. Appendix 1 lists species of Microbotryaceae with their Polygonaceae hosts reported in the literature (molecular and morphological records) and shows currently accepted names and clades for the latter. For example, the monotypic *Liroa emodensis* Berk. (treated as *Microbotryum emodensis* (Berk.) M.Pipenbr. by some) parasitises *Persicaria chinensis* (L.) H.Gross (Kemler *et al.* 2006). The monotypic *Zundeliomyces polygoni* Vánky (possibly a synonym of *Melanopsichium austroamericanum* (Speg.) Beck) uses *Koenigia alpina* (All.) T.M.Schust. & Reveal as host (Vánky 1987). Species of *Sphacelotheca* also only infect Polygonaceae (Vánky 1987, 2002; Vánky & Oberwinkler 1994; Almaraz *et al.* 2002), while species of *Microbotryum* use a broad range of eudicotyledonous host species. In addition to Polygonaceae, *Microbotryum* infects members of Asteraceae, Caprifoliaceae, Caryophyllaceae, Gentianaceae, Lamiaceae, Lentibulariaceae, Onagraceae, Portulacaceae, and Primulaceae (Vánky & Shivas 2008). The life history of these fungi has been linked to that of pollinators, which function in vectoring fungal spores between plants (Kemler *et al.* 2006).

Members of Microbotryaceae differ in several morphological characters such as spore colour, presence or absence of teliospore catenation at some developmental stage, a columella, and peridium (Table 1), but all have septa lacking pores at maturity (Bauer *et al.* 1997). Presence or absence of a peridium is a difficult character, because of confusing statements

Figure 2. Field shot of *Persicaria decipiens* (*Stajsic 7332*) with false smut growing on ovaries. *Sphacelotheca polygoni-serrulati* axillar columella and split peridium indicated by arrows (C = columella and P = peridium).

Table 1. Morphological characters used to distinguish genera of Microbotryaceae.

	Spore mass colour	Columella	Peridium	Immature teliospore catenation
Liroa Cif.	purplish brown	absent	present (but see Vánky 2002)	absent
Microbotryum Lév.	purplish brown	absent	absent	absent
Sphacelotheca de Bary	purplish brown	present	present	present
Zundeliomyces Vánky	pale ochre	absent	present	present

for *Liroa* and *Microbotryum*. Vánky (1998) and Vánky & Shivas (2008) use the absence of a peridium to separate *Liroa* and *Microbotryum* from *Sphacelotheca* in keys for these genera, but the description of *Microbotryum* in these works refers to the presence of peridia (peridium "around" and globose respectively). Likely this is a typographical error, and both the key and description of *Microbotryum* in Vánky (2002) note the absence of a peridium. However, Piepenbring (2002) notes the presence of a peridium in *Liroa* and, though he does not explicitly refer to a peridium, Vánky's (2002) description of *Liroa* notes irregularly globose, stalked swellings that are at first green, which suggests participation of host plant tissues in sorus formation.

In addition to discussing the classification of Microbotryaceae and Polygonaceae phylogeny with regard to parasitism by these false smuts, we report here on new records of *Sphacelotheca polygoni-serrulati* in Australia. This was prompted by finding large populations of *Persicaria decipiens* (R.Br.) K.L.Wilson (Polygonaceae) at the Royal Botanic Gardens Victoria (RBGV), Melbourne, infected with a showy purplish brown smut inhabiting the flowers (Figs. 2 & 3). We identified the fungus using morphological and molecular methods to document the biodiversity supported by this urban environment.

Material and methods

Specimens examined

Although some of the *Persicaria decipiens* populations at RBGV Melbourne were originally planted, most are

Figure 3. Close-up of *V. Stajsic 7254* with *Sphacelotheca polygoni-serrulati* axillar columellae emerging from *Persicaria* flowers and covered with purplish brown teliospores.

self-established. Our collections of *S. polygoni-serrulati* were gathered from self-established host populations. Samples of *P. decipiens* parasitised by false smut from RBGV Melbourne used to examine micro- and macro-morphological characters and for molecular data generation were: VICTORIA. *V. Stajsic 7254* (MEL 2383469A) and *T.M. Schuster TMS14-30A* (MEL 2385255A).

In addition, herbarium specimens of *Persicaria* Mill. at MEL from all Australian states and territories were checked for the presence of false smut. These include ca. 1100 sheets of *P. attenuata* (R.Br.) Soják, *P. barbata* (L.) H.Hara, *P. capitata* (Buch.-Ham. ex D.Don) H.Gross, *P. chinensis* (L.) H.Gross, *P. decipiens*, *P. dichotoma* (Blume) Masam., *P. hydropiper* (L.) Delarbre, *P. lapathifolia* (L.) Delarbre, *P. maculosa* Gray, *P. odorata* (Lour.) Sojak, *P. orientalis* (L.) Spach, *P. praetermissa* (Hook. F.) H.Hara, *P. prostrata* (R.Br.) Soják, *P. strigosa* (R.Br.) Nakai, and *P. subsessilis* (R.Br.) K.L.Wilson.

Morphology

An Olympus SZX16 stereo microscope with camera setup DP71 was used to examine smut morphology and sporulation site in the flowers of *Persicaria decipiens*. A JCM-6000 NeoScope benchtop scanning electron microscope (SEM; Coherent Scientific, Adelaide) was used to observe the smut spores. A portion of a silica gel dried spore mass was spread over a conducting carbon tab and sputter coated with gold without any further treatment. Images (Figs. 4 & 5) were obtained using high vacuum, SEI (secondary electron image), 15kV, and standard probe current.

Sequence Data

Total genomic DNA was extracted from smut samples with the Sigma-Aldrich Extract-N-Amp kit (Sigma-Aldrich, Australia) following manufacturer protocols. To place our smut samples growing on *Persicaria decipiens* at the RBGV within a molecular phylogeny, we amplified and sequenced the nuclear internal transcribed spacer (ITS) region with the primer pair ITS1f and ITS4 (White *et al.* 1990), and the large subunit (LSU) region of the rDNA using the primers LROR and LR3 (Vilgalys & Hester 1990). MyTaq Red DNA polymerase (Bioline, Melbourne) was used for PCR. The following settings were used for PCR: 1 min of 94°C denaturation step followed by 35 cycles of 94°C for 1 min, 55°C for 30 sec and 72°C for 2 min, and a final extension step of 72°C for 7 min. Primers and single stranded DNA were cleaned from

Figure 4. Scanning electron micrograph (*T.M. Schuster 14-30A*) of a spore mass of *Sphacelotheca polygoni-serrulati* with clearly visible disjunctors (one marked with an arrow), which separate multiple spores initially strung together.

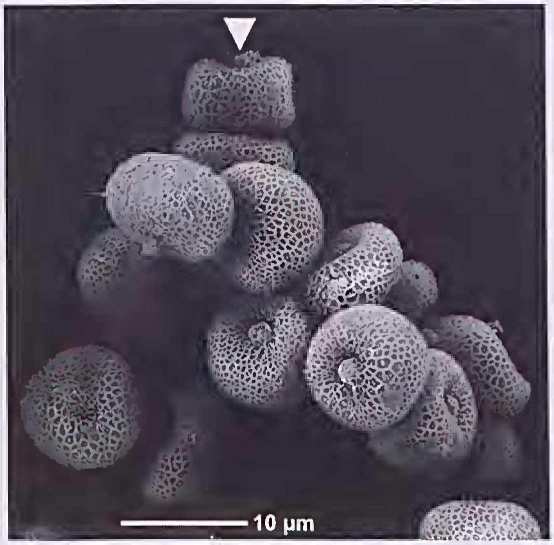
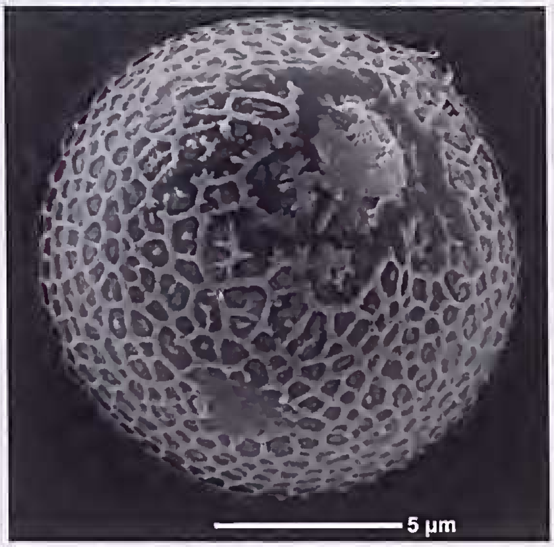


Figure 5. Scanning electron micrograph of teliospore (*T.M. Schuster 14-30A*) with reticulate ornamentation and disjunctor characteristic for *S. polygoni-serrulati*. Reticulum interspaces are irregularly sized and shaped and occasionally feature 1–few warts. The muri are shallow (as compared to some species of *Microbotryum*).



PCR products with exonuclease and arctic phosphatase and amplicons were Sanger sequenced bidirectionally on an AB3730xl analyser (Macrogen, Korea). Sequences were trimmed and assembled using GENEIOUS v.7.0.6. (Biomatters, 2014) and sequence identity was assessed using the BLAST algorithm (Altschul *et al.* 1997) and GENBANK database (http://www.ncbi.nlm.nih.gov/genbank). Resulting sequences from our smut samples have been deposited in GENBANK with the accession numbers: KP311405 (ITS), KP311345 (LSU) for *T.M. Schuster TMS14-30A* and KP311404 (ITS), KP311344 (LSU) for *V. Stajsic 7254*.

Sequence Analysis

Newly generated sequences and related sequences downloaded from GENBANK were aligned using MUSCLE (Edgar 2004). For the ITS region 20 ingroup and two outgroup taxa were included in the analysis. For the LSU region 33 ingroup and one outgroup taxon were included. Due to an incomplete overlap of sampled taxa between the two datasets, we analysed them independently. Maximum Likelihood (ML) analyses were run on the CIPRES Science Gateway v.3.3. computer cluster (Miller *et al.* 2010) using RAxML-HPC2 v.8.0.24. (Stamatakis 2006). Options selected for the RAxML analyses were a GTR GAMMA model and a GTRCAT model for 1000 rapid Bootstrap searches. Tree files were exported and edited with FIGTREE v.1.4.1 (Rambaut 2014). Clade support values in text and Figs. 6 & 7 are shown as percent bootstrap support from the ML analyses.

Results

Specimens on which *Sphacelotheca* was found

Host: *Persicaria decipiens*. AUSTRALIAN CAPITAL TERRITORY. Junction of Brindabella and Lee Creek Road, 14.iv.1966, *N.T. Burbidge 7611* (MEL 1551940B). VICTORIA. Mead, xii.1956, *R. Schier s.n.* (MEL 2385252A); Captain Cook National Park. W side of Thurra River, NNE of Cape Everard, 11.xii.1969, *A.C. Beauglehole 32310[A] & E.W. Finck* (MEL 2385254A); Murray Valley. Kanyapella Wildlife Reserve, near Echuca, 13.x.1990, *E.A. Chesterfield 2680[A]* & N. Disken (MEL 2385253A); South Yarra. Royal Botanic Gardens Melbourne. Ornamental Lake, on E side of Long Island, 31.x. 2014, *V. Stajsic 7254 & L. Hancock* (MEL 2383469A); Royal Botanic Gardens Melbourne. Long Island, 9.xi.2014, *T.M. Schuster TMS14-30A* (MEL 2385255A); South Yarra. Royal Botanic Gardens Melbourne. Ornamental Lake, on E side of Long Island, 11.xi.2014, *V. Stajsic 7259* (MEL 2383475A, BRIP, VPRI); South Yarra. Royal Botanic Gardens Melbourne. Ornamental Lake. A-Gate Wetlands, 24.xi.2014, *V. Stajsic 7332* (MEL 2387398A, DAR).

Morphology

Examination with a stereo microscope revealed peridia and columellae on host plant ovaries with a powdery brown, slightly purple-tinted spore mass (Fig. 3). In addition, some teliospores were catenate when not fully developed and connected by disjunctors, later becoming solitary and usually with attached disjunctors, they lacked polar caps, and spores were mostly spherical or subspherical, 8–12(–15) × 8–12 μm, and had a sculpted surface.

Scanning Electron Microscope imaging showed conspicuous disjunctors and reticulate ornamentation of the teliospores (Fig. 4 & 5). Interspaces between the reticulations, with shallow muri, were irregularly shaped and sized, and some had 1–few warts. Subspherical, torus-shaped spores were occasionally catenate (Fig. 4).

Phylogenetic Analysis

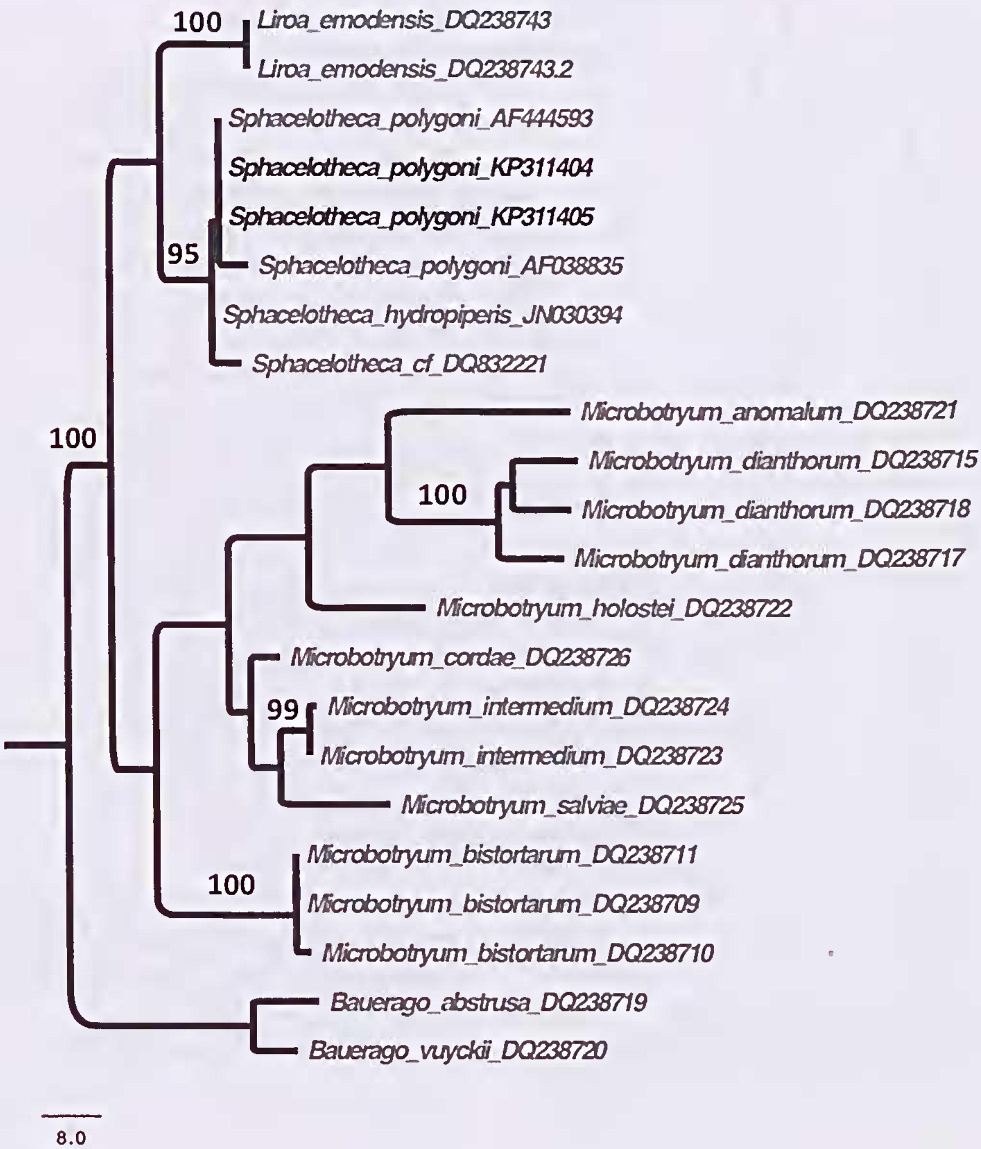
The ITS alignment consisted of 679 characters including 344 that were constant and 98 that were parsimony-informative, whereas the LSU alignment included 889 characters of which 799 were constant and 38 were parsimony informative. The Akaike information criterion indicated that GTR+I+Γ was the most appropriate nucleotide substitution model for ML analyses. The ITS (Fig. 6) and LSU (Fig. 7) ML topologies were congruent with each other and place our samples in a well-supported clade composed of other *Sphacelotheca* isolates, and distinct from *Microbotryum*. In addition, *Liroa* is distinct from *Microbotryum* in our analyses.

Discussion

New records of *Sphacelotheca polygoni-serrulati* in Australia

Our molecular (Figs. 6 & 7) and morphological results corroborate each other and show that the fungus infecting flowers of *Persicaria decipiens* at the RBGV is the false smut *Sphacelotheca polygoni-serrulati*; establishing the first report of this fungus in the state of Victoria. The smut's macro-morphology (Figs. 2 & 3) shows columellae and peridia growing from the *Persicaria decipiens* ovaries and including the purplish brown smut spores characteristic of species of *Sphacelotheca*. Micro-morphological characters revealed by SEM (Figs. 4 & 5) show that the smut spores have clearly visible disjunctors plus the reticulate and sparsely warty ornamentation characteristic of *S. polygoni-serrulati* (Demel *et al.* 1985). *Sphacelotheca polygoni-serrulati* is currently the only species of *Sphacelotheca* recorded in Australia, where it has now been reported from all states except the Northern Territory and Queensland. Since *P. decipiens* occurs in these areas, it is likely that *S. polygoni-serrulati* may still be found there. Other than Australia, *P. decipiens* occurs in Africa, temperate Asia, southern Europe, and New Zealand (National Plant

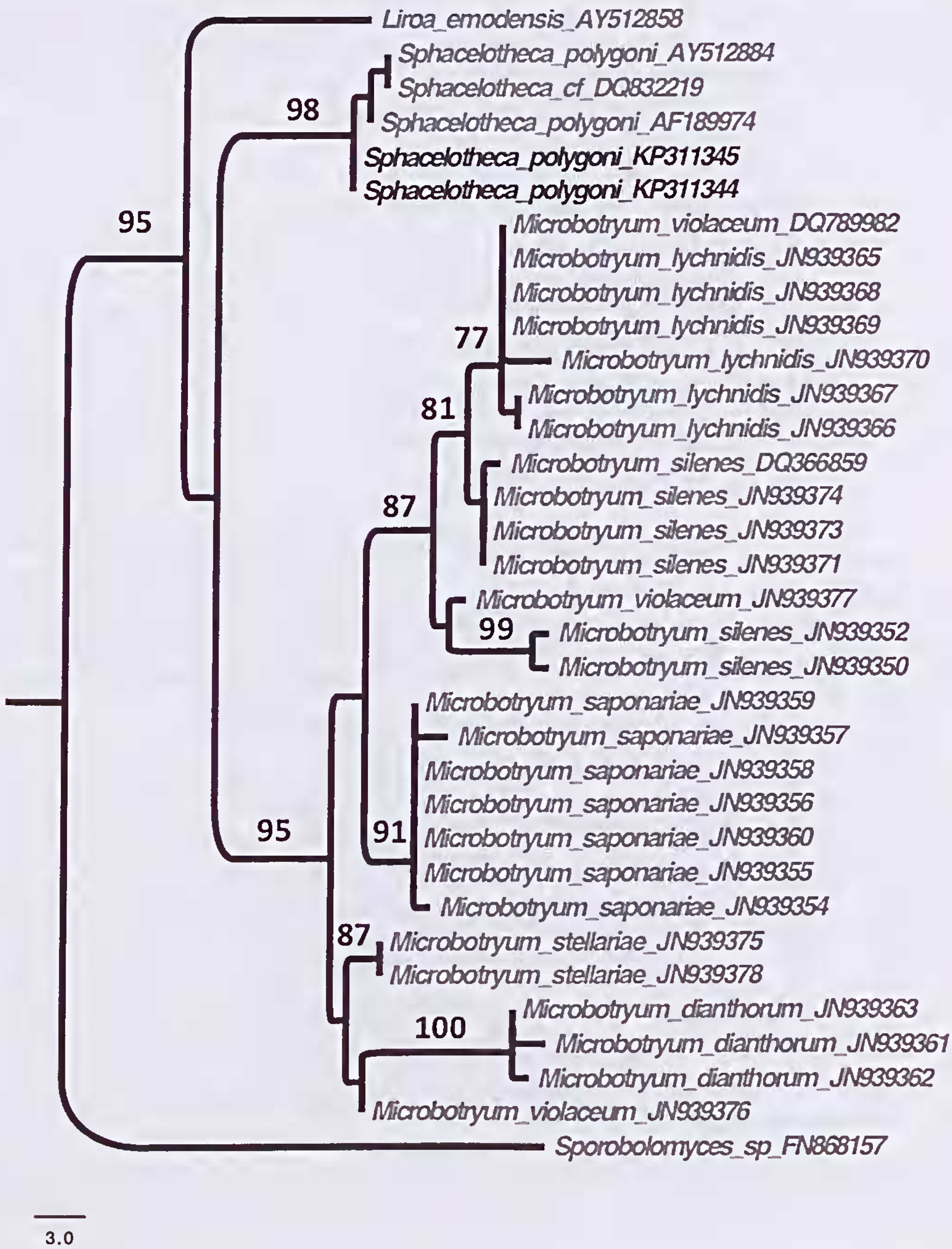
Figure 6. Most likely tree (ln -2327.053) based on RAxML analysis of the ITS rDNA region of 22 taxa. *Bauerago* was included as outgroup. This phylogenetic tree shows the placement of our samples from the Royal Botanic Gardens Victoria (shown in black text) and that they cluster together in a clade having high bootstrap support, which includes other collections of *Sphacelotheca*. Sequences AF444593 and AF038835 are actually *S. polygoni-persicariae*.



Germplasm System 2005; Allan 1982) and *S. polygoni-serrulati* now has been reported throughout most of this host range (Piątek *et al.* 2012; Appendix 1). Notably, neither *P. decipiens* nor *S. polygoni-serrulati* have been reported from the Americas, though *S.* cf *hydropiperis* occurs on *Persicaria acuminata* (Kunth) M. Gómez and *P. punctata* (Elliott) Small in South America (Piepenbring 1996).

We examined all Australian-collected specimens of *Persicaria* at MEL, because Piątek *et al.* (2012) show that *S.*

Figure 7. Most likely tree (ln -1924.234) based on RAxML analysis of the LSU rDNA region of 34 taxa. *Sporobolomyces* was included as outgroup. This phylogenetic tree shows the placement of our samples from the Royal Botanic Gardens Victoria (shown in black text) and that they cluster together in a clade with high bootstrap support, which includes other collections of *Sphacelotheca*. The sequence AF189974 is of *S. polygoni-persicariae*.



polygoni-serrulati also occurs on other species of *Persicaria* outside of Australia (e.g., *P. barbata, P. hydropiper, P. maculosa*, and *P. pulchra* (Blume) Soják). We found an additional specimen of *P. decipiens* from the ACT infected with *S. polygoni-serrulati*, which is the first report for this territory, and a further three Victorian specimens, with the earliest specimen dating to 1956. None of the other species of *Persicaria* examined at MEL were parasitised by *Sphacelotheca*, but a search of *Persicaria* material at other Australian herbaria may yield additional records. Since *S. polygoni-serrulati* has previously been recorded from Western Australia, South Australia, New South Wales, Tasmania, and northern New Zealand (Vánky & Shivas 2008; McKenzie & Vánky 2001), it is not unexpected that this species occurs in the ACT and Victoria, and it is surprising that it has been overlooked so far. On the other hand, a search of the VPRI collections yielded only a single 1893 specimen from Launceston, Tasmania, *L. Rodway 3109* (VPRI; Jacky Edwards pers. comm. 2014; Vánky & Shivas 2008). This might indicate reluctance by botanists to collect clearly diseased plant material for accessioning into herbaria, which might skew the distributional data for pathogenic fungi.

Microbotryaceae and host plant phylogeny

With regard to Microbotryaceae phylogeny, Kemler *et al.*'s (2006) results showed that *Liroa* and *Sphacelotheca* may actually be nested in a monophyletic *Microbotryum*, though clade support values varied considerably depending on alignment method chosen. In our ML analyses, the LSU data show that *Sphacelotheca* (98% bootstrap support) and *Microbotryum* (95% bootstrap support) form well-supported, separate clades (Figs. 6 & 7). ITS data suggest that accessions of *S. polygoni-serrulati* form a distinct clade, though there is no support for this relationship. *Liroa* is not included in *Microbotryum* in either analysis and may be sister to *Sphacelotheca* (ITS) or sister to both (LSU), but further studies are needed to determine this relationship.

Kemler *et al.* (2006, 2009) also showed that affinity of *Microbotryum* for Polygonaceae has likely arisen multiple times across the evolutionary history of these groups and that Persicarieae may have been the first eudicot lineage parasitised by these false smuts. Since this lineage infects all constituent genera of Persicarieae (Fig. 1), it may have co-evolved with the ancestor of Persicarieae. Kemler *et al.* (2006, 2009) also showed that another *Microbotryum* lineage that uses additional eudicot families also parasitises Polygoneae (*Fallopia* Adans. s.s. and *Polygonum* L. s.s.), Persicarieae (*Persicaria* only), and Rumiceae (*Oxyria* Hill and *Rumex* L.). These authors and Oberwinkler (2012) suggested that evolutionary trends in host plant preference of species of *Microbotryum* infecting Caryophyllaceae is narrowly specific, but that it is broad for Polygonaceae. This might actually not be the case and may have been determined by using an obsolete taxonomic concept of *Polygonum* (in the broad sense; Fig. 1). Based on molecular and morphological characters, *Polygonum* s.l. is not a monophyletic group and *Bistorta, Fallopia, Koenigia* sensu Schuster and Reveal (including *Aconogonon*), *Persicaria*, and *Reynoutria* are monophyletic genera that are not closely related to *Polygonum* s.s. (e.g., Sanchez *et al.* 2009; Schuster *et al.* 2015). Hence, species of *Microbotryum* and *Sphacelotheca* may actually be more host specific than previously thought, at least at the generic level. For example, *M. bistortarum* (DC.) Vánky parasitises both *Bistorta officinalis* (L.) Delarbre and *B. vivipara* (L.) Delarbre, and *M. bosniacum* parasitises *Koenigia alpina* and *K. songarica* (Schrenk ex Fisch. & C.A.Mey.) T.M.Schust. & Reveal (Chlebicki 2006). Both *Bistorta* and *Koenigia* sensu Schuster and Reveal lack detailed phylogenies, and are most speciose in temperate Asia where false smut fungi diversity is also great (Chlebicki 2006). Researchers sampling for molecular phylogenies of these plant groups should keep an eye out for associated false smut fungi, whose diversity is likely also understudied.

A co-evolutionary study of false smuts and their plant hosts will be necessary to settle the taxonomic questions raised here, and to understand the evolutionary history of both lineages. This would be a complex undertaking, since it will require careful sampling of both the plant hosts and species of *Bauerago, Liroa, Melanospichium, Microbotryum, Sphacelotheca, Zundeliomyces* and other members of Microbotryales (Chlebicki 2006; Kemler *et al.* 2006, 2009). In conclusion, our findings show that it is still possible to discover new and even fairly conspicuous organisms in urban environments and points to the importance of maintaining green spaces in densely populated areas for biodiversity research and conservation.

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Appendix 1. A survey of the literature including morphological or molecular data citing occurrences of false smut fungi *Liroa, Microbotryum, Sphacelotheca, Zundeliomyces* (Pucciniomycotina), *Entyloma, Melanopsichium* and *Thecaphora* (Ustilaginomycotina) parasitising Polygonaceae plant hosts. Currently accepted names for species of Polygonaceae and clades to which they belong (tribes) are also shown. N/A denotes not available.

Spp. No. (50 total)	Fungi	Polygonaceae clade	Polygonaceae host species (currently accepted name)	Synonym used in publication	Publication	Collection location (fungus)
1.	*Entyloma polygoni-amphibii* Săvul.	Persicarieae	*Persicaria amphibia* (L.) Delarbre	*Polygonum amphibium* L.	Klenke & Schaller 2015; but see Vánky & Oberwinkler 1994	Italy
1.	*Liroa emodensis* (Berk.) Cif.	Persicarieae	*Persicaria chinensis* (L.) H.Gross	*Polygonum chinense* L.	Kemler et al. 2006; Piepenbring 2002	China, India, Indonesia, Nepal, Philippines, Sri Lanka, Taiwan
1.	*Melanopsichium austroamericanum* (Speg.) Beck	Persicarieae	*Persicaria punctata* (Elliott) Small	*Polygonum punctatum* Elliott	Vánky 2013	Argentina
2.	*Melanopsichium pennsylvanicum* Hirschh.	Persicarieae	*Persicaria pensylvanica* (L.) M.Gómez	*Polygonum pennsylvanicum* L.	Vánky 2013	North America
1.	*Microbotryum ahmadianum* (Syd.) Vánky	Persicarieae	*Koenigia rumicifolia* (Royle ex Bab.) T.M.Schust & Reveal	*Polygonum rumicifolium* Royle ex Bab.	Vánky 1998	India
2.	*Microbotryum anomalum* (J.Kunze ex G.Winter) Vánky	Polygoneae	*Fallopia baldschuanica* (Regel) Holub	*Fallopia aubertii* (L.Henry) Holub	Kemler et al. 2006	Hungary (cultivated)
	Microbotryum anomalum (J.Kunze ex G.Winter) Vánky	Polygoneae	*Fallopia convolvulus* (L.) Á.Löve		Kemler et al. 2009	Germany
	Microbotryum anomalum (J.Kunze ex G.Winter) Vánky	Polygoneae	*Fallopia dumetorum* (L.) Holub		Kemler et al. 2009	Germany
	Microbotryum anomalum (J.Kunze ex G.Winter) Vánky	Polygoneae	*Fallopia scandens* (L.) Holub	*Polygonum scandens* L.	Fischer 1953	North America
3.	*Microbotryum aviculare* (Lira) Vánky	Polygoneae	*Polygonum aviculare* L.		Vánky 1998	Finland
	Microbotryum aviculare (Lira) Vánky	Polygoneae	*Polygonum oxyspermum* subsp. *raii* (Bab.) D.A.Webb & Chater	*Polygonum raii* Bab.	Vánky 1994	N/A
4.	*Microbotryum bistortarum* (DC.) Vánky	Persicarieae	*Bistorta bistortoides* (Pursh) Small	*Polygonum bistortoides* Pursh	Vánky 2013	N/A
	Microbotryum bistortarum (DC.) Vánky	Persicarieae	*Bistorta carnea* (K.Koch) Kom. ex Tzvelev	*Polygonum carneum* K.Koch	Vánky 1998	N/A
	Microbotryum bistortarum (DC.) Vánky	Persicarieae	*Bistorta milletii* (H. Lév.) H. Lév.	*Polygonum taipaishanense* H.W.Kung	Vánky 2013	N/A
	Microbotryum bistortarum (DC.) Vánky	Persicarieae	*Bistorta officinalis* (L.) Delarbre	*Polygonum bistorta* L.	Kemler et al. 2009	Switzerland
	Microbotryum bistortarum (DC.) Vánky	Persicarieae	*Bistorta vivipara* (L.) Delarbre	*Polygonum viviparum* L.	Kemler et al. 2006	Germany, Italy, Mongolia

Spp. No. (50 total)	Fungi	Polygonaceae clade	Polygonaceae host species (currently accepted name)	Synonym used in publication	Publication	Collection location (fungus)
5.	*Microbotryum bosniocum* (G.Beck) Vánky	Persicarieae	*Aconogonon ochreotum* var. *loxmonnii* (Lepech.) Tzvelev [likely *Koenigio*]	*Polygonum loxmonnii* Lepech.	Vánky 1998	N/A
	Microbotryum bosniocum (G.Beck) Vánky	Persicarieae	*Koenigia olpina* (All.) T.M.Schust. & Reveal	*Polygonum olpinum* All.	Kemler et al. 2006	Italy
	Microbotryum bosniocum (G.Beck) Vánky	Persicarieae	*Koenigio corioro* (Grig.) T.M.Schust. & Reveal	*Polygonum buchoricum* Grig., *Polygonum coriorium* Grig.	Vánky 1998	N/A
	Microbotryum bosniocum (G.Beck) Vánky	Persicarieae	*Koenigio dovisioe* (W.H.Brewer ex A.Gray) T.M.Schust. & Reveal	*Polygonum newberryi* Small	Vánky 1998	North America
	Microbotryum bosniocum (G.Beck) Vánky	Persicarieae	*Koenigia songorico* (Schrenk) T.M.Schust. & Reveal	*Polygonum songoricum* Schrenk	Vánky 1998	N/A
	Microbotryum bosniacum (G.Beck) Vánky	Persicarieae	*Koenigia tripterocarpa* (A.Gray) T.M.Schust. & Reveal	*Polygonum tripterocarpum* A.Gray	Vánky 2013	N/A
	Microbotryum bosniacum (G.Beck) Vánky	Persicarieae	*Persicaria punctata* (Elliott) Small	*Polygonum punctatum* Elliott	Vánky 2013	N/A
6.	*Microbotryum cilinode* (Savile) Vánky	Polygoneae	*Follopio cilinodis* (Michx.) Holub	*Bilderdykio cilinodis* (Michx.) Greene, *Polygonum cilinode* Michx.	Vánky 1998	North America
7.	*Microbotryum cordoe* (Liro) G.Deml & Prillinger	Persicarieae	*Koenigio componuloto* (Hook.f.) T.M.Schust & Reveal	*Polygonum componulotum* Hook.f.	Vánky 2013	N/A
	Microbotryum cordoe (Liro) G.Deml & Prillinger	Persicarieae	*Persicorio bungeono* (Turcz.) Nakai	*Polygonum bungeonum* Turcz.	Vánky 2013	China
	Microbotryum cordoe (Liro) G.Deml & Prillinger	Persicarieae	*Persicorio coespitoso* (Blume) Nakai	*Polygonum coespitosum* Blume	Vánky 2013	N/A
	Microbotryum cordoe (Liro) G.Deml & Prillinger	Persicarieae	*Persicorio folioso* (H.Lindb.) Kitag.	*Polygonum foliosum* H.Lindb.	Vánky 1994	Finland
	Microbotryum cordae (Liro) G.Deml & Prillinger	Persicarieae	*Persicaria hydropiper* (L.) Spach	*Polygonum hydropiper* L.	Kemler et al. 2006	Germany
	Microbotryum cordae (Liro) G.Deml & Prillinger	Persicarieae	*Persicaria hydropiperoides* (Michx.) Small	*Polygonum hydropiperoides* Michx.	Vánky & Oberwinkler 1994	N/A
	Microbotryum cordoe (Liro) G.Deml & Prillinger	Persicarieae	*Persicorio moculoso* A.Gray	*Polygonum persicorio* L.	Vánky & Oberwinkler 1994	Germany
	Microbotryum cordoe (Liro) G.Deml & Prillinger	Persicarieae	*Persicorio minor* (Huds.) Opiz	*Polygonum minus* Huds.	Vánky & Oberwinkler 1994	Finland
	Microbotryum cordoe (Liro) G.Deml & Prillinger	Persicarieae	*Persicario mitis* (Schrank) Holub	*Polygonum mite* Schrank	Vánky & Oberwinkler 1994	Italy

Spp. No. (50 total)	Fungi	Polygonaceae clade	Polygonaceae host species (currently accepted name)	Synonym used in publication	Publication	Collection location (fungus)
	Microbotryum cordoe (Liro) G.Deml & Prillinger	Persicarieae	*Persicoria posumbu* (Buch.-Ham. ex D.Dan) H.Grass	*Palyganum pasumbu* Buch.-Ham. ex D.Dan	Vánky 2013	N/A
	Microbotryum cardae (Lira) G.Deml & Prillinger	Persicarieae	*Persicaria punctata* (Elliatt) Small	*Palyganum punctatum* Elliatt	Vánky & Oberwinkler 1994	N/A
	Micrabatryum cardae (Lira) G.Deml & Prillinger	Persicarieae	*Persicaria raseaviridis* Kitag.	*Palyganum raseaviride* (Kitag.) S.X.Li & Y.L.Chang	Vánky 2013	N/A
	Micrabatryum cardae (Lira) G.Deml & Prillinger	Persicarieae	*Persicaria viscasa* (Buch.-Ham. ex D.Dan) H.Grass ex Nakai	*Polyganum viscasum* Buch.-Ham. ex D. Don	Vánky 2013	N/A
8.	*Microbotryum caranotum* (Lira) Vánky	Rumiceae	*Rumex britannica* L.		Vánky 1998	Narth America
9.	*Micrabotryum dehiscens* (L.Ling) Vánky	Persicarieae	*Bistorto officinalis* (L.) Delarbre	*Palyganum nitens* (Fisch. & C.A.Mey.) Petrav ex Kom.	Chlebicki 2006	Kazakhstan
	Micrabatryum dehiscens (L.Líng) Vánky	Persicarieae	*Bistarta vivipara* (L.) Delarbre	*Palygonum viviparum* L.	Vánky 1998	N/A
	Microbotryum dehiscens (L.Ling) Vánky	Persicarieae	*Persicaria amplexicaulis* (D.Don) Ronse Decr. [misidentified *Bistorta sinomontana* (Sam.) Miyam.?]	*Polygonum amplexicaule* D.Don	Vánky 1998	India
10.	*Microbotryum dumosum* (Vánky & Oberw.) Vánky	Rumiceae	*Rumex dumosus* A.Cunn. ex Meisn.		Vánky 1998	Australia
	Microbotryum dumosum (Vánky & Oberw.) Vánky	Rumiceae	*Rumex obtusifolius* L.		Vánky & Shivas 2008	Australia
	Micrabotryum dumasum (Vánky & Oberw.) Vánky	Rumiceae	*Rumex pulcher* L.		Vánky & Shivas 2008	Australia
	Micrabatryum dumasum (Vánky & Oberw.) Vánky	Rumiceae	*Rumex tenax* Rch.f.		Vánky & Shivas 2008	Australia
11.	*Microbatryum filamenticola* (L.Ling) Vánky	Persicarieae	*Persicaria japanica* (Meisn.) Nakai	*Palyganum japanicum* Meisn.	Vánky 1998	China
12.	*Microbatryum gaeppertianum* (J.Schraet.) Vánky	Rumiceae	*Rumex ocetaso* L.		Vánky 1998	Poland
	Microbatryum gaeppertianum (J.Schraet.) Vánky	Rumiceae	*Rumex alpestris* Jacq.		Vánky 1998	N/A
	Microbatryum goeppertianum (J.Schraet.) Vánky	Rumiceae	*Rumex scutatus* L.		Vánky 1998	N/A
	Microbotryum goeppertianum (J.Schroet.) Vánky	Rumiceae	*Rumex thyrsiflorus* Fingerh.		Vánky 1998	N/A
13.	*Microbotryum himalense* (Kakish & Y.Ono)	Persicarieae	*Bistorta officinalis* (L.) Delarbre	*Polygonum bistorta* L.	Vánky 1998	Nepal
	Microbatryum himalense (Kakish & Y.Ona)	Persicarieae	*Bistarta suffulta* (Maxim.) Greene ex H. Grass	*Palygonum suffultaum* Maxim.	Vánky 2013	N/A

Spp. No. (50 total)	Fungi	Polygonaceae clade	Polygonaceae host species (currently accepted name)	Synonym used in publication	Publication	Collection location (fungus)
14.	*Microbotruym koenigioe* (Rostr.) Vánky	Persicarieae	*Koenigio islondico* L.		Vánky 1998	Greenland
	Microbotruym koenigioe (Rostr.) Vánky	Persicarieae	*Koenigio piloso* Maxim.		Vánky 2013	N/A
1S.	*Microbotryum kuehneonum* (R.Wolff) Vánky	Rumiceae	*Rumex ocetoso* L.		Ainsworth & Sampson 19S0	England
	Microbotryum kuehneonum (R.Wolff) Vánky	Rumiceae	*Rumex ocetosello* L.		Almaraz et al. 2002; Vánky 1998	Germany, North America, Spain
	Microbotryum kuehneonum (R.Wolff) Vánky	Rumiceae	*Rumex olpestris* Jacq.	*Rumex orifolius* All.	Vánky 1998	N/A
	Microbotryum kuehneonum (R.Wolff) Vánky	Rumiceae	*Rumex crispus* L.		Ainsworth & Sampson 1950	England
	Microbotryum kuehneonum (R.Wolff) Vánky	Rumiceae	*Rumex hostotulus* Baldwin		Vánky 2013	N/A
	Microbotryum kuehneanum (R.Wolff) Vánky	Rumiceae	*Rumex tuberosus* L.		Vánky 2013	N/A
16.	*Microbotryum longisetum* (Vánky & Oberw.)Vánky	Persicarieae	*Persicaria longiseta* (Bruijn) Kitag.	*Polygonum longisetum* Bruijn	Vánky 1998	Taiwan
17.	*Microbotryum morginole* (DC.) Vánky	Persicarieae	*Bistorto officinolis* (L.) Delarbre	*Polygonum bistorto* L., *Polygonum nitens* (Fisch. & C.A.Mey.) Petrov ex Kom.	Kemler et al. 2009; Vánky 1998; Vánky 2013	France, Poland, Switzerland
	Microbotryum morginole (DC.) Vánky	Persicarieae	*Bistorto bistortoides* (Pursh) Small	*Polygonum bistortoides* Pursh	Vánky 2013	N/A
	Microbotryum morginole (DC.) Vánky	Persicarieae	*Bistorto comeo* (K.Koch) Kom. ex Tzvelev	*Polygonum comeum* K.Koch	Vánky 2013	N/A
	Microbotryum morginole (DC.) Vánky	Persicarieae	*Bistorto elliptico* (Willd. ex Spreng.) D.F. Murray & Elven	*Polygonum ellipticum* Willd. ex Spreng.	Vánky 2013	N/A
18.	*Microbotryum moelleri* (Bref.) Vánky	Persicarieae	*Persicoria hispida* (Kunth) M.Gómez	*Polygonum hispidum* Kunth	Vánky 2013	Brazil
19.	*Microbotryum nepolense* (Liro) Vánky	Persicarieae	*Persicoria nepalensis* (Meisn.) H.Gross	*Polygonum olotum* Buch.-Ham. ex D.Don	Kemler et al. 2006; Vánky 1998	India, China
20.	*Microbotryum ocreorum* (Berk.) Vánky	Persicarieae	*Koenigio componuloto* (Hook.f.) T.M.Schust. & Reveal	*Polygonum componulotum* Hook.f.	Vánky 1998	China
21.	*Microbotryum porlotorei* (A.A.Fisch.Waldh.) Vánky	Rumiceae	*Rumex ocetosello* L.		Fischer 1953	North America
	Microbotryum porlotorei (A.A.Fisch.Waldh.) Vánky	Rumiceae	*Rumex olpinus* L.		Vánky 1998	N/A
	Microbotryum porlatorei (A.A.Fisch.Waldh.) Vánky	Rumiceae	*Rumex oltissimus* Alph. Wood		Vánky 1998	N/A

Spp. No. (50 total)	Fungi	Polygonaceae clade	Polygonaceae host species (currently accepted name)	Synonym used in publication	Publication	Collection location (fungus)
	Microbotryum porlotorei (A.A.Fisch.Waldh.) Vánky	Rumiceae	*Rumex britonnico* L.		Fischer 1953	North America
	Microbotryum porlotorei (A.A.Fisch.Waldh.) Vánky	Rumiceae	*Rumex crispus* L.		Vánky 1998	N/A
	Microbotryum porlotorei (A.A.Fisch.Waldh.) Vánky	Rumiceae	*Rumex dentotus* L.		Vánky 1998	N/A
	Microbotryum porlotorei (A.A.Fisch.Waldh.) Vánky	Rumiceae	*Rumex hostotulus* 8aldwin		Fischer 1953	North America
	Microbotryum porlotorei (A.A.Fisch.Waldh.) Vánky	Rumiceae	*Rumex longifolius* DC.		Vánky 1998	Norway
	Microbotryum porlotorei (A.A.Fisch.Waldh.) Vánky	Rumiceae	*Rumex moritimus* L.		Kemler et al. 2006	Germany
	Microbotryum parlatorei (A.A.Fisch.Waldh.) Vánky	Rumiceae	*Rumex mexicanus* Meisn.		Vánky 1998	N/A
	Microbotryum parlatorei (A.A.Fisch.Waldh.) Vánky	Rumiceae	*Rumex obtusifolius* L.		Vánky & Shivas 2008	Australia
	Microbotryum porlotorei (A.A.Fisch.Waldh.) Vánky	Rumiceae	*Rumex polustris* Sm.		Vánky 1998	N/A
22.	*Microbotryum poucireticulotum* Vánky	Persicarieae	*Persicorio orientolis* (L.) Spach	*Polygonum orientole* L.	Vánky 2013	India
23.	*Microbotryum picoceum* (Lagerh. & Liro) Vánky	Persicarieae	*Koenigio forrestii* (Diels) Měsíček & Soják		Vánky 1998	N/A
	Microbotryum picoceum (Lagerh. & Liro) Vánky	Persicarieae	*Koenigio islondico* L.		Vánky 1998	Norway
24.	*Microbotryum piperi* (G.P.Clinton) Vánky	Persicarieae	*Koenigia alpina* (All.) T.M.Schust. & Reveal	*Polygonum alpinum* All., *Polygonum undulatum* P.J. Bergius	Vánky1998; Chlebicki 2006	Italy, Kazakhstan
	Microbotryum piperi (G.P.Clinton) Vánky	Persicarieae	*Koenigio dovisioe* (W.H.Brewer ex A.Gray) T.M.Schust. & Reveal	*Polygonum dovisioe* W.H.8rewer ex A.Gray	Vánky 1998	North America
	Microbotryum piperi (G.P.Clinton) Vánky	Persicarieae	*Koenigio phytoloccifolio* (Meisn. ex Small) T.M.Schust. & Reveal	*Polygonum phytoloccoefolium* Meisn.	Vánky 1998	North America
	Microbotryum piperi (G.P.Clinton) Vánky	Persicarieae	*Koenigio rumicifolio* (Royle ex Bab.) T.M.Schust. & Reveal	*Polygonum rumicifolium* Royle ex 8ab.	Vánky 2013	N/A
	Microbotryum piperi (G.P.Clinton) Vánky	Persicarieae	*Koenigio songorico* (Schrenk) T.M.Schust. & Reveal	*Polygonum songoricum* Schrenk	Vánky 1998	N/A
	Microbotryum piperi (G.P.Clinton) Vánky	Persicarieae	*Koenigio tripterocorpo* (A.Gray) T.M.Schust. & Reveal	*Polygonum tripterocorpum* A.Gray	Vánky 2013	N/A
25.	*Microbotryum polygoni-oloti* (Thirum. & M.S.Pavgi) Vánky	Persicarieae	*Persicorio nepolensis* (Meisn.) H.Gross	*Polygonum olotum* (8uch.-Ham. ex D.Don	Vánky 1998	India

Spp. No. (50 total)	Fungi	Polygonaceae clade	Polygonaceae host species (currently accepted name)	Synonym used in publication	Publication	Collection location (fungus)
26.	*Microbotryum prostratum* (Vánky & Oberw.) Vánky	Persicarieae	*Persicaria prostrata* (R.Br.) Soják	*Polygonum prostratum* R.Br.	Vánky 1998	Australia
	Microbotryum prostratum (Vánky & Oberw.) Vánky	Persicarieae	*Persicaria subsessilis* (R.Br.) K.L.Wilson	*Polygonum subsessile* R.Br.	Vánky 2013	N/A
27.	*Microbotryum pustulatum* (DC.) R. Bauer & Oberw.	Persicarieae	*Bistorta officinalis* (L.) Delarbre	*Polygonum bistorta* L., *Polygonum nitens* (Fisch. & C.A.Mey.) Petrov ex Kom.	Kemler et al. 2006; Vánky 2013	France, Germany, Switzerland
	Microbotryum pustulatum (DC.) R. Bauer & Oberw.	Persicarieae	*Bistorta cornea* (K.Koch) Kom. ex Tzvelev	*Polygonum corneum* K.Koch	Vánky 2013	N/A
	Microbotryum pustulatum (DC.) R. Bauer & Oberw.	Persicarieae	*Bistorta elliptica* (Willd. ex Spreng.) D.F. Murray & Elven	*Polygonum ellipticum* Willd. ex Spreng.	Vánky 2013	N/A
	Microbotryum pustulatum (DC.) R. Bauer & Oberw.	Persicarieae	*Bistorta vivipara* (L.) Delarbre	*Polygonum viviparum* L.	Vánky 1998	Norway
28.	*Microbotryum radians* (Vánky & Oberw.) Vánky	Persicarieae	*Persicaria coreyi* (Olney) Greene	*Polygonum coreyi* Olney	Vánky 1998	North America
29.	*Microbotryum reticulatum* (Liro) R.Bauer & Oberw.	Persicarieae	*Persicaria amphibia* (L.) Delarbre	*Polygonum amphibium* L., *Polygonum coccineum* Muhl. ex Willd.	Fischer 1953	North America
	Microbotryum reticulatum (Liro) R.Bauer & Oberw.	Persicarieae	*Persicaria longiseta* (Bruijn) Kitag.	*Polygonum blumei* Meisn. ex Miq.	Vánky 2013	N/A
	Microbotryum reticulatum (Liro) R.Bauer & Oberw.	Persicarieae	*Persicaria careyi* (Olney) Greene	*Polygonum careyi* Olney	Fischer 1953	North America
	Microbotryum reticulatum (Liro) R.Bauer & Oberw.	Persicarieae	*Persicaria lapathifolia* (L.) Delarbre	*Polygonum lapathifolium* L.	Kemler et al. 2006	Austria, Bulgaria, Switzerland
	Microbotryum reticulatum (Liro) R.Bauer & Oberw.	Persicarieae	*Persicaria pensylvanica* (L.) M.Gómez	*Polygonum pennsylvanicum* L.	Fischer 1953	North America
	Microbotryum reticulatum (Liro) R.Bauer & Oberw.	Persicarieae	*Persicaria senegalensis* (Meisn.) Soják	*Polygonum senegalense* Meisn.	Vánky 2013	Rwanda
	Microbotryum reticulatum (Liro) R.Bauer & Oberw.	Persicarieae	*Persicaria sagittata* (L.) H.Gross	*Polygonum sagittatum* L.	Fischer 1953	North America
	Microbotryum reticulatum (Liro) R.Bauer & Oberw.	Polygoneae	*Polygonum aviculare* L.		Fischer 1953	North America
30.	*Microbotryum rhei* (Zundel) Vánky	Rumiceae	*Rheum maximowiczii* Losinsk.		Vánky 1998	Kazakhstan
	Microbotryum rhei (Zundel) Vánky	Rumiceae	*Rheum rhabarbarum* L.	*Rheum undulatum* L., *Rheum franzenbachii* Münter	Vánky 1998	N/A
	Microbotryum rhei (Zundel) Vánky	Rumiceae	*Rheum tataricum* L.f.		Vánky 2013	N/A
	Microbotryum rhei (Zundel) Vánky	Rumiceae	*Rheum wittrockii* C.E. Lundstr.		Vánky 1998	N/A

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31.	*Microbotryum shostense* (Zundel) Vánky	Polygoneae	*Polygonum shostense* W.H.Brewer	*Polygonum shostense* W.H.Brewer	Kemler et al. 2006	North America
32.	*Microbotryum stewortii* (Zundel) Vánky	Rumiceae	*Rheum webbianum* Royle		Vánky 1998	India
33.	*Microbotryum stygium* (Liro) Vánky	Rumiceae	*Rumex acetosa* L.		Kemler et al. 2006	Germany
	Microbotryum stygium (Liro) Vánky	Rumiceae	*Rumex alpestris* Jacq.	*Rumex arifolius* All.	Vánky 1998	N/A
	Microbotryum stygium (Liro) Vánky	Rumiceae	*Rumex scutatus* L.		Vánky 1998	N/A
	Microbotryum stygium (Liro) Vánky	Rumiceae	*Rumex thyrsiflorus* Fingerh.		Vánky 1998	N/A
34.	*Microbotryum tenuisporum* (Cif.) Vánky	Persicarieae	*Persicaria acuminata* (Kunth) M.Gómez	*Polygonum acuminatum* Kunth	Vánky 1998	N/A
	Microbotryum tenuisporum (Cif.) Vánky	Persicarieae	*Persicaria barbata* (L.) H.Hara	*Polygonum barbatum*	Vánky 1998	N/A
	Microbotryum tenuisporum (Cif.) Vánky	Persicarieae	*Persicaria glabra* (Willd.) M.Gómez	*Polygonum glabrum* Willd.	Kemler et al. 2006	India
	Microbotryum tenuisporum (Cif.) Vánky	Persicarieae	*Persicaria hydropiper* (L.) Spach	*Persicaria hydropiper* (L.) Spach	Vánky & Shivas 2008	Australia
	Microbotryum tenuisporum (Cif.) Vánky	Persicarieae	*Persicaria hydropiperoides* (Michx.) Small	*Polygonum hydropiperoides* Michx.	Vánky 2013	N/A
	Microbotryum tenuisporum (Cif.) Vánky	Persicarieae	*Persicaria lapathifolia* (L.) Delarbre	*Polygonum lapathifolium* L., *Polygonum lanigerum* R. Br.	Vánky 2013	N/A
	Microbotryum tenuisporum (Cif.) Vánky	Persicarieae	*Persicaria punctata* (Elliott) Small	*Polygonum punctatum* Elliott	Piepenbring 1996; Vánky & Shivas 2008	Argentina, Costa Rica
35.	*Microbotryum tovarae* (Saville) Vánky	Persicarieae	*Persicaria virginiana* (L.) Gaertn.	*Polygonum virginianum* L.	Vánky 1998	North America
36.	*Microbotryum tuberculiforme* (Syd. & Syd.) Vánky	Persicarieae	*Persicaria chinensis* (L.) H.Gross	*Polygonum chinense* L.	Vánky 2013	N/A
	Microbotryum tuberculiforme (Syd. & Syd.) Vánky	Persicarieae	*Persicaria runcinata* (Buch.-Ham. ex D.Don) H.Gross	*Polygonum runcinatum* Buch.-Hamilt. ex D.Don	Kemler et al. 2006	Taiwan
37.	*Microbotryum tumeforme* (L.Ling) Vánky	Persicarieae	*Persicaria chinensis* (L.) H.Gross	*Polygonum chinense* L.	Vánky 1998	India
	Microbotryum tumeforme (L.Ling) Vánky	Rumiceae	*Rumex crispus* L.	*Rumex magellanicus* Campd.	Vánky 2013	N/A
38.	*Microbotryum vinosum* (Tul. & C.Tul.) Denchev	Rumiceae	*Oxyria digyna* (L.) Hill	*Oxyria digyna* (L.) Hill	Almaraz et al. 2002	N/A
39.	*Microbotryum wormingii* (Rostr.) Vánky	Rumiceae	*Rumex aquaticus* L.		Vánky 1998	N/A
	Microbotryum wormingii (Rostr.) Vánky	Rumiceae	*Rumex arcticus* Trautv.		Vánky 2013	N/A
	Microbotryum wormingii (Rostr.) Vánky	Rumiceae	*Rumex crispus* L.		Vánky 1998	Norway
	Microbotryum wormingii (Rostr.) Vánky	Rumiceae	*Rumex longifolius* DC.		Vánky 1998	N/A

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1.	*Sphacelotheca fagopyri* Syd., P.Syd. & E.J.Butler	Fagopyreae	*Fagopyrum esculentum* Moench		Saccardo 1912	India
2.	*Sphacelotheca hydropiperis* (Schumach.) deBary	Persicarieae	*Koenigia nummularifolia* (Meisn.) Měsíček & Soják	*Polygonum nummularifolium* Meisn.	Vánky & Oberwinkler 1994	N/A
	Sphacelotheca hydropiperis (Schumach.) deBary	Persicarieae	*Persicaria acuminata* (Kunth) M.Gómez	*Polygonum acuminatum* Kunth	Piepenbring 1996	Costa Rica
	Sphacelotheca hydropiperis (Schumach.) deBary	Persicarieae	*Persicaria decipiens* (R.Br.) K.L.Wilson	*Polygonum serrulatum* Lag.	Kakishima & Ono 1993; http://mycoportal.org	India, Pakistan
	Sphacelotheca hydropiperis (Schumach.) deBary	Persicarieae	*Persicaria filiformis* (Thunb.) Nakai	*Polygonum filiforme* Thunb.	Vánky & Oberwinkler 1994	Japan
	Sphacelotheca hydropiperis (Schumach.) deBary	Persicarieae	*Persicaria hispida* (Kunth) M.Gómez	*Polygonum hispidum* Kunth	Vánky & Oberwinkler 1994	N/A
	Sphacelotheca hydropiperis (Schumach.) deBary [as *Sphacelotheca koordersiana* (Bref.) Zundel]	Persicarieae	*Persicaria hydropiper* (L.) Spach	*Polygonum hydropiper* L.	Piepenbring 1996; Vánky 2002	Costa Rica
	Sphacelotheca hydropiperis (Schumach.) deBary	Persicarieae	*Persicaria maculosa* A.Gray	*Polygonum persicaria* L.	Vánky 1994	N/A
	Sphacelotheca hydropiperis (Schumach.) deBary	Persicarieae	*Persicaria minor* (Huds.) Opiz	*Polygonum minus* Huds.	Vánky & Oberwinkler 1994	N/A
	Sphacelotheca hydropiperis (Schumach.) deBary	Persicarieae	*Persicaria mitis* (Schrank) Holub	*Polygonum mite* Schrank	Vánky & Oberwinkler 1994	N/A
	Sphacelotheca hydropiperis (Schumach.) deBary [as *Sphacelotheca borealis* (G.P.Clinton) Schellenb.]	Persicarieae	*Persicaria posumbu* (Buch.-Ham. ex D.Don) H.Gross	*Polygonum posumbu* Buch.-Ham. ex D.Don	http://mycoportal.org	China
	Sphacelotheca hydropiperis (Schumach.) deBary	Persicarieae	*Persicaria punctata* (Elliott) Small	*Polygonum punctatum* Elliott	Piepenbring 1996	Costa Rica
	Sphacelotheca hydropiperis (Schumach.) deBary	Persicarieae	*Persicaria sagittata* (L.) H.Gross	*Polygonum sagittatum* L.	Vánky & Oberwinkler 1994	North America
	Sphacelotheca hydropiperis (Schumach.) deBary	Persicarieae	*Persicaria sagittifolia* (H.Lév. & Vaniot) H.Gross	*Polygonum sagittifolium* H.Lév. & Vaniot	Vánky & Oberwinkler 1994	N/A
	Sphacelotheca hydropiperis (Schumach.) deBary	Persicarieae	*Persicaria strindbergii* (J.Schust.) Galasso	*Polygonum strindbergii* J.Schust.	Vánky & Oberwinkler 1994	N/A
	Sphacelotheca hydropiperis (Schumach.) deBary	Persicarieae	*Persicaria thunbergii* (Siebold & Zucc.) H.Gross	*Polygonum thunbergii* Siebold & Zucc.	Vánky & Oberwinkler 1994	N/A
3.	*Sphacelotheca koordersiana* (Bref.) Zundel	Persicarieae	*Persicaria acuminata* (Kunth) M.Gómez	*Polygonum acuminatum* Kunth	Vánky & Oberwinkler 1994	Costa Rica
	Sphacelotheca koordersiana (Bref.) Zundel	Persicarieae	*Persicaria barbata* (L.) H.Hara	*Polygonum barbatum* L.	Vánky & Oberwinkler 1994	Java

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	Sphacelatheca kaardersiana (Bref.) Zundel	Persicarieae	*Persicaria decipiens* (R.Br.) K.L.Wilson	*Palyganum salicifalium* Brauss. ex Willd.	Vánky & Oberwinkler 1994; McKenzie & Vánky 2001	New Zealand
4.	*Sphacelotheca palygani-serrulati* Maire	Persicarieae	*Persicaria barbata* (L.) H.Hara	*Palyganum barbatum* L.	Vánky & Oberwinkler 1994	Rwanda
	Sphacelatheca palygani-serrulati Maire	Persicarieae	*Persicaria decipiens* (R.Br.) K.L.Wilsan	*Palyganum serrulatum* Lag.	Maire 1917; 2002; Kemler et al. 2009	Algeria, Greece, Spain
	Sphacelatheca palygani-serrulati Maire	Persicarieae	*Persicaria decipiens* (R.Br.) K.L.Wilsan		Vánky & Shivas 2008; Piątek et al. 2012	Australia, Cameraan
	Sphacelotheca polygoni-serrulati Maire	Persicarieae	*Persicaria maculosa* Gray	*Polygonum persicaria* L.	Vánky 1994	Madeira
	Sphacelotheca polygoni-serrulati Maire	Persicarieae	*Persicaria pulchra* (Blume) Soják	*Persicaria pulchra* (Blume) Soják	Piątek et al. 2012	Zambia
	Sphacelotheca polygoni-serrulati Maire	Persicarieae	*Persicaria setosula* (A.Rich.) K.L.Wilson	*Polygonum setosulum* A.Rich.	Vánky 1994	N/A
5.	*Sphacelotheca serrulati-magna* Vánky & Oberw.	Persicarieae	*Persicaria decipiens* (R.Br.) K.L.Wilson	*Polygonum salicifolium* Brouss. ex Willd.	Vánky & Oberwinkler 1994	Greece
1.	*Thecaphora schwarzmaniana* Byzova	Rumiceae	*Rheum cordatum* Losinsk.		Vánky 2013	Kazakhstan
	Thecaphora schwarzmaniana Byzova	Rumiceae	*Rheum macrocarpum* Losinsk.	*Rheum lobatum* Litv. ex Losinsk.	Vánky 2013	N/A
	Thecaphora schwarzmaniana Byzova	Rumiceae	*Rheum palmatum* L.		Vánky 2013	N/A
	Thecaphara schwarzmaniana Byzava	Rumiceae	*Rheum ribes* L.		Vasighzadeh et al. 2014	Iran
1.	*Zundeliamyces palygani* Vánky	Persicarieae	*Kaenigia alpina* (All.) T.M.Schust. & Reveal	*Palyganum alpinum* All.	Vánky 19B7	Kazakhstan